

Successful Use of Low Dose Combined Spinal-Epidural Anesthesia During Cesarean Section in Eisenmenger Syndrome

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Abstract

Cardiac diseases are among the most important causes of mortality and morbidity during pregnancy. It is recommended that those with pulmonary hypertension (PH), cyanotic heart diseases, severe mitral stenosis (MS), aortic stenosis (AS) and patients with functional class 3-4 according to the New York Heart Association (NYHA) not become pregnant. In these situations, a multidisciplinary approach including cardiologist, gynecologist, anesthesiologist and neonatologists is necessary. Cesarean section (CS) in pregnant cases with Eisenmenger syndrome represents a high risk for anesthesia. General anesthesia, spinal anesthesia, epidural anesthesia and combined spine epidural anesthesia (CSEA) techniques may be used for CS of pregnant cases with severe cardiac diseases. There is no proven superiority for any of these techniques. We wished to share our experience of CSEA administered successfully to two high-risk pregnant cases during cesarean sections.

Keywords: Combined spinal-epidural anesthesia, Cesarean section, Eisenmenger syndrome

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Eisenmenger Sendromunda Sezaryen Sırasında Düşük Doz Kombine Spinal-Epidural Anestezi Kullanımı

Öz

Kardiyak hastalıklar, hamilelik sırasında en önemli mortalite ve morbidite nedenleri arasındadır. New York Kalp Birliği'ne (NYHA) göre pulmoner hipertansiyon (PH), siyanotik kalp hastalıkları, ağır mitral darlık (stenoz) (MS), aort darlığı (AS) ile fonksiyonel sınıf 3-4 olan hastaların hamile kalmamaları önerilmektedir. Bu gibi durumlarda, kardiyolog, jinekolog, anestezi uzmanı ve neonatologları içeren multidisipliner bir yaklaşım gereklidir. Eisenmenger sendromlu gebe olgularda sezaryen (CS), anestezi için yüksek risk oluşturur. Genel anestezi, spinal anestezi, epidural anestezi ve kombine spinalepidural anestezi (CSEA) teknikleri, ciddi kalp hastalığı olan gebelerin CS'lerinde kullanılabilir. Bu tekniklerin hiçbirinde kanıtlanmış bir üstünlük yoktur. Bu yazıda sezaryen sırasında başarılı bir şekilde yönetilen CSEA tecrübemizi iki yüksek riskli gebe vakasına paylaşmak istedik.

Anahtar Sözcükler: Kombine spinal-epidural anestezi, Sezaryen, Eisenmenger sendromu

Introduction

Appropriate management and delivery strategies for pregnant patients with congenital or acquired heart disease are very important for clinicians. A variety of anesthesia methods administered for cesarean section can cause different hemodynamic responses related to the cardiac status of the patient. Though mostly diagnosed and treated in the childhood period, still some cases with Eisenmenger syndrome may present in the adulthood. The triad of systemic to pulmonary congenital cardiovascular communication [Atrial septal defect (ASD) and ventricular septal defect (VSD) etc.], pulmonary arterial disease, and cyanosis is called Eisenmenger Syndrome. Initial left to right shunt leads to excessive increase in right heart volume and pressure and elevated pulmonary vascular resistance resulting in reversal of shunt (1). The physiological changes in pregnancy cause the right to left shunt to become more severe leading to serious maternal and fetal complications. Increased right to left shunting during systemic vasodilatation is associated with worsening of cyanosis and increased maternal, fetal, neonatal mortality and morbidity in the peripartum period (2). Though pregnancy is not recommended in pulmonary hypertension (PH), there are many cases reports in the literature (3,4). The aim during anesthesia maintenance is to ensure appropriate anesthesia and analgesia for the surgical intervention while reducing pulmonary vascular

resistance and reducing the risk of developing myocardial depression to a minimum.

Case report

Both of our patients included in the highest-risk group by the cardiology. The patients and relatives were informed before Cesarean section (CS) and written consent was obtained.

Case I: The patient presented to the emergency room due to respiratory distress during her first pregnancy. The patient was 21 years old. Her history revealed that she has had symptoms since childhood, such as occasional palpitations and exertional dyspnea which increased and worsened during pregnancy. However, she had no diagnosis of cardiac disease. In the 32nd week of an unmonitored pregnancy, the patient found to have bilateral crackles and cardiac murmur on auscultation. Additionally, the patient had cyanotic appearance and spoon nails were noteworthy. Transthoracic Echocardiographic (TTE) assessment identified 3 cm peri-membranous VSD, severe right-left shunt (140 mmHg peak gradient), and severe PH (mean PAP, pulmonary arterial pressure, 85 mmHg). Patient's functional status was New York Heart Association (NYHA) Class 4. The patient was operated under emergency conditions. Before the CS the patient had blood pressure (BP) measured as 90/50 and 500 mL colloids were administered.

In the operating room patient had heart rate (HR): 120 beats/min, BP: 121/62 mmHg and SpO₂: 56 (on room air). Then CSEA was administered in the L2-3 intervertebral space. Low dose of 1 cc 0.5% hyperbaric bupivacaine (Marcaine® spinal heavy, 0.5%, Astra Zeneca) and 10 µg fentanyl were administered over 10 seconds into the subarachnoid space. Later an epidural catheter was inserted and a total of 7 cc 0.5% isobaric bupivacaine and 3 cc pulmonary stenosis (PS) was administered into the epidural space divided into 3 cc doses. To avoid hypotension after CSEA 5 µg/kg/min dobutamine was begun. BPe was very closely monitored and dobutamine was increased to 8 µg/kg/min and later stopped postoperatively when no longer required. During the CS, no serious hemodynamic variations were observed and a 2850 g live male neonate was born successfully. With 1-min APGAR score of 5 and 5-min APGAR score of 8. After the CS the mother was transferred to the intensive care unit with stable general condition. Afterwards, she was transferred to the cardiology ward on the 1st day. During monitoring on the ward, the patient's general status suddenly worsened and the patient died due to cardiac pathologies present on the 3rd postoperative day.

Case II: A 32 year old female patient with known congenital ASD and Eisenmenger Syndrome currently was G5P4. Her 4th pregnancy had resulted in miscarriage in the 7th week due to cardiac problems and she was now 35+5 gestational weeks. The patient was admitted to the cardiology ward in the 27th week of pregnancy. Functional capacity was NYHA class 3 and the patient was stable in terms of cardiac functions but was monitored closely due to early membrane rupture and risk of cardiac decompensation. TTE revealed EF (ejection fraction) of 50% with enlarged right ventricle with right ventricle (RV) strain findings, interatrial septum had 24 mm secundum type ASD, estimated pulmonary artery systolic pressure (ePASP) 120 mmHg and mean PAP 85 mmHg. Sildenafil 3x20 mg and oksapar 1x0.4 mL treatment was begun. The patient reached 35+5 weeks of gestation and the decision

was made for a cesarean delivery by cardiology and gynecology team due to the decompensation risk. CSEA was planned and preoperative HR was 119, with BP 127/76 and SpO₂ 96. The patient had an epidural catheter inserted in the L2-3 intervertebral space and a total of 7 cc 0.5% isobaric bupivacaine (Marcaine®, 0.5%, Astra Zeneca), 1 cc lidocaine and 1 cc PS divided into 3 cc doses administered into the epidural space. Then for spinal anesthesia low-dose 5 mg 0.5% hyperbaric bupivacaine (Marcaine®, 0.5%, Astra Zeneca) was administered over 10 seconds into the L3-4 intervertebral space. After this, BP was 104/61, HR 126, and SpO₂ was 94%. The patient wore an oxygen mask and waited for 20 min in slightly left lateral decubitus position while inhaled iloprost (Ventavist®) was administered. Ten minutes after the CS began a 1980 g live male neonate was born. The 1 min APGAR score was measured as 8. After the baby was born the patient was placed in reverse Trendelenburg position. Immediately iv 2 mg midazolam (Dormicum®) and 25 IU oxytocin (Synpitan®) were administered. The patient was administered a total of 300 cc Normal saline, with 50 cc urine output. After the successful CS, the patient had HR 88, BP 82/46 and SpO₂ 98 and was transferred to the intensive care unit (ICU) for close monitoring.

Discussion

Despite the advancement in the fields of cardiology and obstetrics, heart diseases are still the most important cause of maternal mortality and morbidity (5). Pregnancy in Eisenmenger patients is associated with high maternal and intrauterine fetal death risk. The maternal mortality is reported up to 50% among these patients (6). Linked to arterial vasodilatation that results in increased right to left shunting and hypoxemia (7). In these patients the morbidity and mortality are correlated with functional status. Low functional capacity (NYHA class 3-4) is associated with high risk in terms of maternal mortality (8). With increased maternal cyanosis in pregnancy, the intrauterine fetal loss risk is shown to increase and vary from 75 to 85%. Additionally, intrauterine growth retardation and early birth rates

are frequently reported. Pregnant individuals with cardiac disease have a perinatal mortality rate of up to 28% (7, 8). Delayed diagnosis and late admission to hospital are risk factors for mortality (9). Our first case had low socioeconomic level and without known diagnosis of cardiac disease. In Eisenmenger syndrome, it is still controversial about whether to use general anesthesia or regional anesthesia as anesthetic method for surgical operations or whether pain-free normal vaginal birth is needed. Platzmann et al. used extracorporeal membrane oxigenation (ECMO) for the first time and reported a patient with successful normal birth in the literature (10).

Though general anesthesia is the most commonly-chosen anesthesia method, reflex response developing after intubation during administration changes systemic vascular resistance and may increase pulmonary artery pressure. Positive-pressure ventilation reduces venous return and may increase pulmonary vascular resistance. There are risks such as difficult intubation, aspiration, hypertensive response linked to laryngoscopy and intubation and cardiac depression after induction (11). The principle aim for anesthesia management of these patients is to reduce the right to left shunt to a minimum to prevent hypoxemia worsening. For this, many anesthesiologists choose epidural or combined spinal-epidural anesthesia administration. In recent years, there are publications stating that neuraxial techniques (controlled epidural or combined spinal-epidural) are safe for pain-free birth and cesarean when administered to many pregnant cases with cardiac diseases (12). Boukhris et al. (13) successfully administered epidural anesthesia and perioperative nitric oxide in a case report about anesthesia management for CS in a case with single ventricle and Eisenmenger syndrome. For both of our patients we administered CSEA in a way that without hemodynamic instability. Low-dose hyperbaric bupivacaine was administered to avoid the hypotension effect of spinal anesthesia, and both patients were transferred to intensive care after the CS without hemodynamic problems.

During administration of spinal anesthesia alone, rapid sympathectomy and rapid reduction in systemic vascular resistance may develop. Epidural anesthesia causes fewer cardiac problems compared to general and spinal anesthesia in patients with pulmonary hypertension. In our cases, as a result, we have seen that low-dose CSEA can be reliably used for severe PH patients. The aim of anesthesia management should be to keep right ventricular filling at optimum level, avoid increases in pulmonary vascular resistance and falls in systemic vascular resistance, and preserve normal sinus rhythm by avoiding tachycardia (14).

For management of pregnant cases with Eisenmenger syndrome, a multidisciplinary approach including cardiologist, gynecologist, anesthesiologist and neonatologists is needed to reduce mortality related to the mother and baby. We successfully administered combined spinal-epidural anesthesia to both of our cases.

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